

# RMCS

Royal Military College of Science  
Shrivenham  
Swindon Wilts SN6 8LA England

# Cranfield

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## MODELLING COMBAT AS A SERIES OF MINI-BATTLES

BY

MICHAEL R. BATHE

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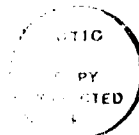
## MODELLING COMBAT AS A SERIES OF MINI-BATTLES

1. This is the first Interim Report on a study which will investigate the feasibility of modelling conventional battalion level combat using the network battle concept and assess the value of such an approach.
2. The original proposal for this study envisaged that the work programme would involve five major tasks:
  - 2. data collection and analysis,
  - 2. derivation of a suitable methodology for generating the network of mini-battles,
  - 2. investigation of various attrition methodologies,
  - 2. development and verification of a combat model, and
  - 2. validation and assessment of the combat model.

The progress to date in each of these tasks will be discussed in turn.  
Keywords: Mathematical Models. (A-1)

### DATA COLLECTION AND ANALYSIS

3. Although the divisibility of a battle into a series of separate small scale engagements is not a totally new concept, it was the analysis of trials data by Rowland et al (References A and B) at the Defence Operational Analysis Establishment (DOAE) in the UK which sparked off the current interest in network battle modelling.
4. Following on from the work at DOAE the Royal Armament Research and Development Establishment (RARDE) in the UK investigated the network structure of two of their battlegroup level combat models (Reference C). RMCS have now extended this work and carried out a comparison of the results obtained from four different battlegroup level combat models and the trials data analysed by DOAE.



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## ATTRITION METHODOLOGIES

10. In a network based combat model the opposing forces will fight a series of mini-battles, and hence the attrition methodology used must be one appropriate to engagements involving a relatively small number of weapons on either side. A Lanchester based approach to determining battle attrition has the advantage of giving a fairly fast running model as compared with a detailed Monte Carlo simulation, however, a critique of the Lanchester methodology has already been made by Ancker (Reference E). RMCS have now carried out further investigations to try and identify the particular weaknesses of the Lanchester approach when used to assess attrition in mini-battles. As a result of these investigations a modified Lanchester type model has been developed and is currently being evaluated.
11. An alternative approach being considered is based on extending the work by Gafarian and Ancker (Reference F) and Wand (Reference G) on stochastic duels to few-versus-few engagements.

## DEVELOPMENT OF A COMBAT MODEL

12. In order to obtain some idea of the effect of structuring combat as a series of mini-battles a very simple Lanchester based simulation model has been developed. With this model the main battle can be split into a sequence of mini-battles each one, except possibly the last, with the same predetermined force sizes. Each force consists of only one type of weapon and each mini-battle continues until one side is annihilated.
13. Using this simple model it has been shown that varying the force ratio in the mini-battles can have a considerable effect on the outcome of the main battle.

- D.     Horsley, G.D. & Jerrome, N.A., "The Tactical Battle Simulation (TABS): A General Description", CAP Scientific Ltd., Reference 5195/TR/1-1, January 1985.
- E.     Ancker, C.J., "The Validity of Assumptions Underlying Current Uses of Lanchester's Attrition Rates", paper presented at the International Symposium on Advances in Combat Modelling held at the Royal Military College of Science, Shrivenham, Swindon, UK, 4-7 September 1984.
- F.     Gafarian, A.V. & Ancker, C.J., "The Two-on-One Stochastic Duel", TRASANA report TR-43-83, December 1983.
- G.     Wand, K., "Mathematical Models of Military Systems", RMCS (Cranfield) PhD thesis in preparation.